# Deep Space Optical Communications (DSOC)

Completed Technology Project (2011 - 2016)

## Project Introduction

Develop and integrate technologies for demonstrating optical communication from deep-space thereby retiring the risk for achieving at least ten times the data return capacity for future NASA missions

## Anticipated Benefits

Benefits to NASA Funded Missions: The GCD Program funded DSOC Project will accelerate a near term Technology Demonstration Mission (TDM) that will retire the risk of infusing optical communications into future NASA missions. A successful TDM will serve as a precursor toward an operational capability. Eventually use of optical technology from deep-space will address the ever increasing demand on link capacity for NASA's future deep-space science and human exploration missions. Furthermore, the benefits can be realized without additional mass or power burden. Large volumes of uncompressed data can be returned to earth while utilizing shorter contacts, thereby allowing missions to spend more time gathering science and exploration data. Immediate enabling features will be the ability to stream multiple channels of high-definition imagery from deep-space. Longer term benefits will include high precision ranging for navigation and science, as well as, novel light science applications. Benefits to Other Government Agencies: Some of the technology spin-off from the current development has the potential of benefitting other government agencies. Benefits to the Commercial Space Industry: The commercial sector is showing an interest in deep-space ventures, both for human exploration, as well as, mining. This technology can support the communications needed to support such ventures. Benefits to the Nation: Advanced communication capability to cover farther reaches with higher capacity is needed for leading space exploration and science. Adding optical communications is a compelling augmentation of the NASA and US space communication tool box.


Deep Space Optical Communications

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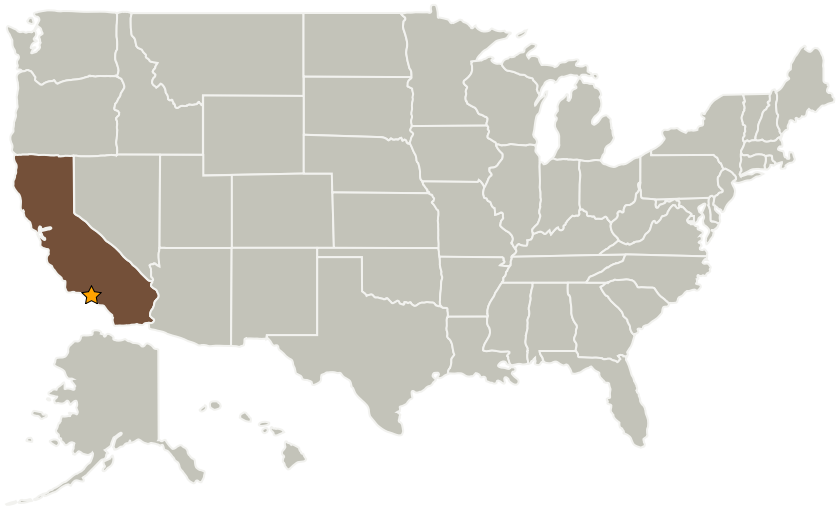
## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Jet Propulsion Laboratory(JPL) | Lead Organization | NASA Center | Pasadena, California |

| Primary U.S. Work Locations |
|---|
| California |

## Project Transitions

**October 2011:** Project Start

**July 2016:** Advanced within the program

**Advanced To:** Another project within the program

**Details:** In FY16, DSOC was selected for further development as part of the Tec hnology Demonstration Missions program.

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Jet Propulsion Laboratory (JPL)

**Responsible Program:**

Game Changing Development

## Project Management

**Program Director:**

Mary J Werkheiser

**Program Manager:**

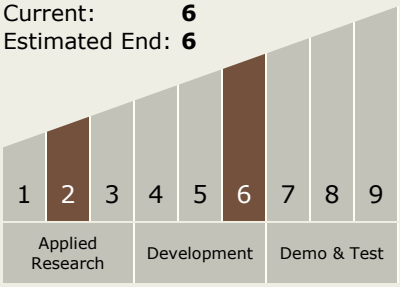
Gary F Meyering

**Principal Investigator:**

Abhijit Biswas

## Technology Maturity (TRL)

Start: **2**
Current: **6**
Estimated End: **6**



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**September 2016:** Closed out

**Closeout Summary:** Deep Space Optical Communications (DSOC) DSOC spent four years in the GCD portfolio—from FY12 to FY15—and progressed from a TRL level 2 to a TRL level 5. Its goal was to develop key technologies needed for imp lementing a technology demonstration of optical communications from deep spa ce ranges. Upon closeout, the project delivered the following: Isolation Pointing Assembly (IPA); Photon Counting Camera (PCC); Laser Transmitter Assembly (L TA); optical assembly and electronics needed to assemble a representative fligh t; and a ground photon counting detector array of a size compatible with a large aperture collector such as the Hale telescope at Palomar Mountain.

## Stories

Flight Laser Transceiver Climbs Ladder to TRL Goal
*(https://techport.nasa.gov/file/164939)*

## Links

DSOC Fact Sheet
*(https://www.nasa.gov/sites/default/files/atoms/files/fs_dsoc_factsheet_150910_1.pdf)*

## Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

## Target Destination

Foundational Knowledge